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COURTSHIP AND MATING BEHAVIOR OF *SCYTHRIS FLAVIVENTRELLA* (SCYTHRIDIDAE)

Pietro Passerin d'Entrèves and Claudio Fessile

Department of Animal Biology, University of Turin,
Via Accademia Albertina 17 - 10123 Turin, Italy

ABSTRACT. Three larvae of *Scythis flaviventrella* (H.-S.) were found in Italy on *Helianthemum apenninum* (Miller) (Cistaceae) and two on *Astragalus onobrychis* (Linné) (Fabaceae). They were reared in the laboratory so that adult behavior could be studied immediately after eclosion. Courtship and mating are described for the first time; courtship was brief but mating lasted 6–7 hours. Both females remated after 48 hours. Oviposition was not observed. Notes on larval morphology and behavior are included.

Additional key words: *Helianthemum apenninum*, Cistaceae, *Astragalus onobrychis*, Fabaceae, larvae.

Even though much has been published about caterpillars and larval food plants of Scythrididae, numerous discrepancies exist in the observations published by different authors for the same species. These discrepancies throw doubt on the supposed polyphagous habits and intraspecific structural variation of the larvae, or both, of those species.

Recent taxonomic and nomenclatural works (Bengtsson 1984, Jäckh 1977, 1978; Passerin d'Entrèves 1976, 1977, 1979, 1980) based on close examination of adult specimens preserved in museum collections reveal that scythridids frequently have been misidentified. In some cases, the two sexes of the same species have been described under different specific names. Consequently, the previously published data about immatures and food plants of these species are unreliable.

Additionally, there is no published account of the courtship and mating behavior of any scythridid species. Contrary to other groups of Lepidoptera (Grant & Brady 1975, Greenfield & Coffelt 1983, Trematerra 1988, Zagatti 1981, 1985), such behavioral studies are almost non-existent in the Gelechioidea, to which the Scythrididae belong.

Here we describe courtship and mating behavior of adults of the European moth, *Scythris flaviventrella* (Herrich-Schäffer) (Scythrididae), and present some observations of the larvae and food plants. This species belongs to the monophyletic *aerariella* species group as defined by Passerin d'Entrèves (1982). Species of this group mainly use Fabaceae as food plants. Previously, *S. flaviventrella* has been reared only on *Vicia* (Fabaceae) (Hauder 1912, Lhomme 1949, Gozmány 1955).

Scythris flaviventrella is known from Spain, France, Italy (newly recorded from specimens mentioned here), Austria, Czechoslovakia, Hungary, Romania, and possibly Yugoslavia and Albania (Passerin d'Entrèves in press).

FIG. 1. Habitat of *Scythris flaviventrella* (H.-S.). on Mt. Rocciamelone, Susa Valley, Piémont, Italy.

MATERIALS AND METHODS

Five last-instar caterpillars were collected on the southern slope of Mt. Rocciamelone, Susa Valley, Piémont, Italy, elev. ca. 1000 m, 11 June 1986. The location was xerothermic and characterized by the phytogeographic association *Trinio-Stipetum* (Braun-Blanquet 1961) (Fig. 1). Three caterpillars were found on *Helianthemum apenninum* (Miller) (Cistaceae) and two were found on *Astragalus onobrychis* (Linné) (Fabaceae). The caterpillars were kept on their respective host plants, brought to the laboratory for study, and kept in cages for observation. The cages were constructed with a framework of light, rectangular timber frames (60 × 35 cm and about 80 cm high) supporting four lateral walls of Plexiglas up to a height of 40 cm and the remaining upper portion with gauze.

The plants, taken with their entire root system and surrounding soil, were placed in the cages and planted in additional soil, taken from the same location as the plants, which covered the floor of the cages. Humidity was regulated by frequent spraying with water. Temperature and lighting were natural, since the cages were kept outside. It did not prove necessary to replace the food plants, which remained in good condition throughout the time period necessary for the maturation of the larvae and the appearance of the adults.

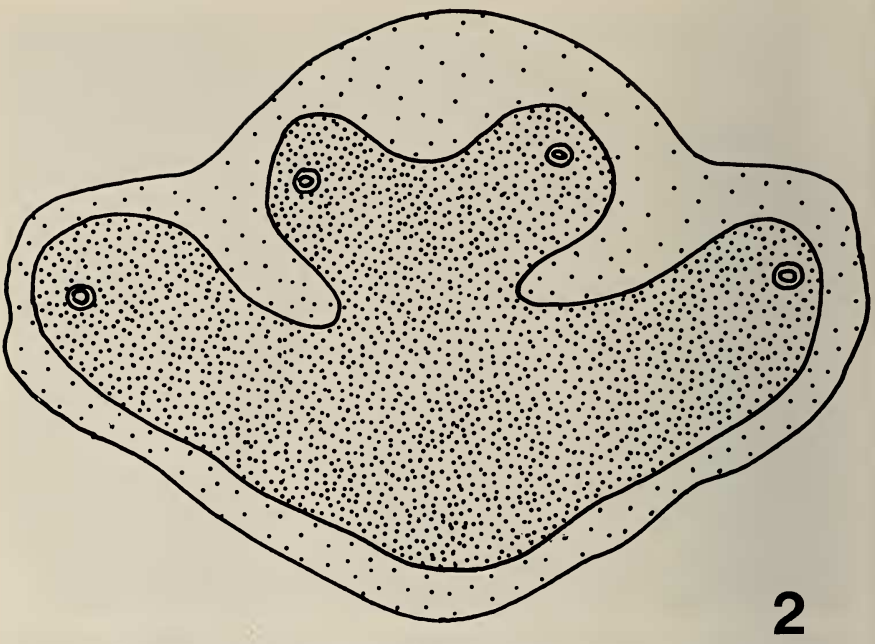

FIG. 2. Posterior view of the anal shield of last instar larva of *Scythris flaviventrella* (H.-S.).

RESULTS

Last-instar caterpillars reached 13–14 mm in length and were chestnut-grey and mottled. The anal shield, described here for the first time, was trilobate and shiny black (Fig. 2).

Each caterpillar made a loose web to tie together the apical leaves of the food plant. The web enclosed a more protective and densely woven silken tube that was longitudinally attached to the stem (Fig. 3). Larvae left the silken tube and climbed to the tip of the plant to feed on the apical leaves. If the leaves were touched, the alerted larva first hid motionless alongside the stem; if further disturbed, it swiftly retreated inside the silken tube. If the web was destroyed, the caterpillar immediately built another one.

Pupation occurred inside a thick white cocoon on the host plant (Fig. 4) or elsewhere (e.g., on the cage wall). On Mt. Rocciamelone, adults emerged in late June and early July, during the cooler hours of the day, following a 10–12 day pupal period. The adults flew little, and, during the warmest hours of the day, took refuge at the base of the host plant, near the ground.

Three males and two females were reared from the 5 specimens collected. These specimens are preserved in the Collection Passerin d'Entrèves, Turin, Italy.

FIG. 3. Web of *Scythris flaviventrella* (H.-S.). Larva on food plant *Astragalus onobrychis*.

FIG. 4. Last instar larva of *Scythris flaviventrella* (H.-S.) in silken tube.

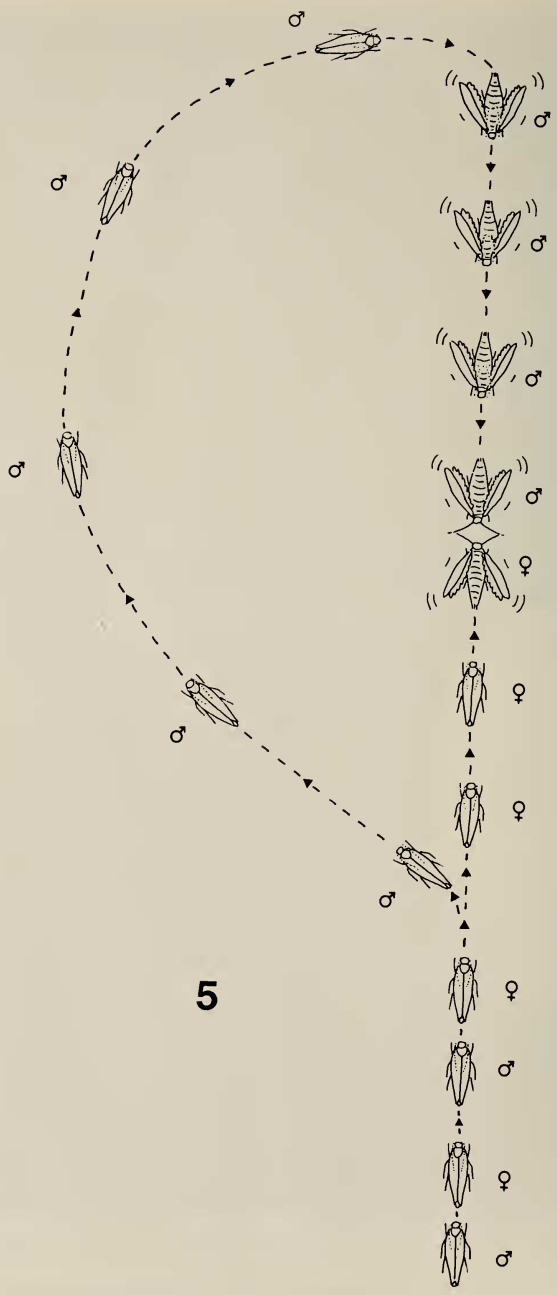

FIG. 5. Preliminary ethogram of courtship behavior of *Scythris flaviventrella* (H.-S.).

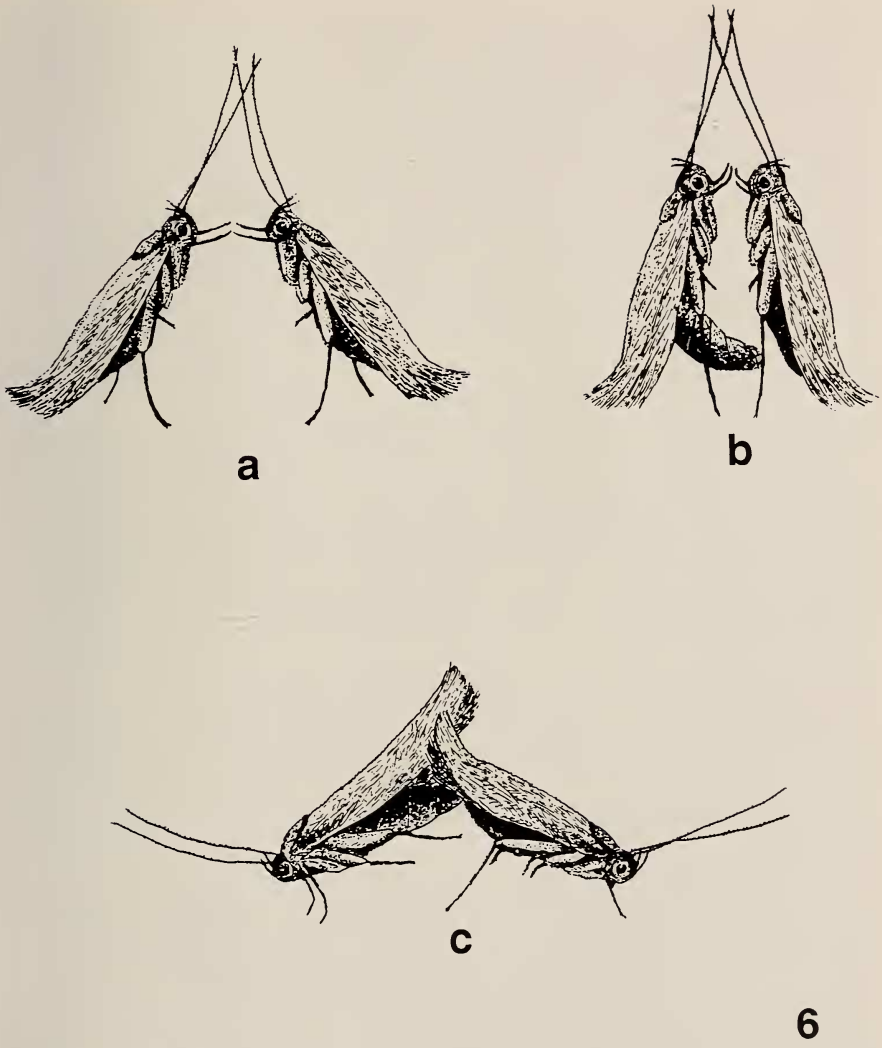

FIG. 6. Courtship and mating behavior of *Scythris flaviventrella* (H.-S.) (see text for explanation).

Courtship and Mating

Four courtships and matings in the rearing cages were observed. Initially, both male and female flew separately to the top of the cage where they landed. A few seconds later, the male located the female, possibly by sensing a pheromone (Zagatti 1985:1257) and began to follow her by walking behind at a distance of about 10 cm. After some

time, while the female continued walking in a straight path, the male walked in a broad loop around the female and came to rest 5.6 cm in front of her. There the male began to vibrate his wings and the female stopped. The male walked to within 2–3 cm of the female and vibrated his wings once more, then walked closer again, to within 1 cm, and repeated the wing vibration. Contact then took place, the moths touching the apices of their antennae and simultaneously vibrating their wings very strongly (Fig. 5). They then opposed their forelegs and raised themselves vertically until only their hindlegs and the apices of their wings touched the substrate (Fig. 6a). After a few seconds, the male bent his abdomen toward the female and grasped her genitalia (Fig. 6b). Once coupling had taken place, the moths threw themselves sideways by a rapid rotation of their bodies and finally lay tail to tail, where they remained motionless until mating was completed (Fig. 6c).

During copulation, attempts by another male to displace the mating male were observed, but none was successful. The second male tried to force the mating male away by pushing and hitting him with his head. Three matings began in the middle of the afternoon and lasted about 6–7 hours. Each of the two females remated after an interval of about 48 hours. No oviposition was observed.

DISCUSSION

On the basis of the limited observations reported here, we cannot drawn firm conclusions about the average duration of mating, the significance of the second mating, the possibility of pheromone emission, or the quality and quantity of various stimuli (olfactory, tactile, visual) involved in courtship.

The lengthy and repeated matings we observed could be involved in sperm competition, a phenomenon known in other insects, including Lepidoptera (see Drummond 1984). The long period of copulation may be required for spermatophore transfer, a process known to be lengthy in many Lepidoptera (Drummond 1984). Curiously, we found no evidence of a spermatophore in the *bursa copulatrix* of either of the two mated females. Further rearing is in progress to attempt to answer some of the questions raised by these observations.

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